U.S. Energy Information Administration

‹ Countries

Korea, South

Last Updated: January 17, 2013 (Notes)

full report

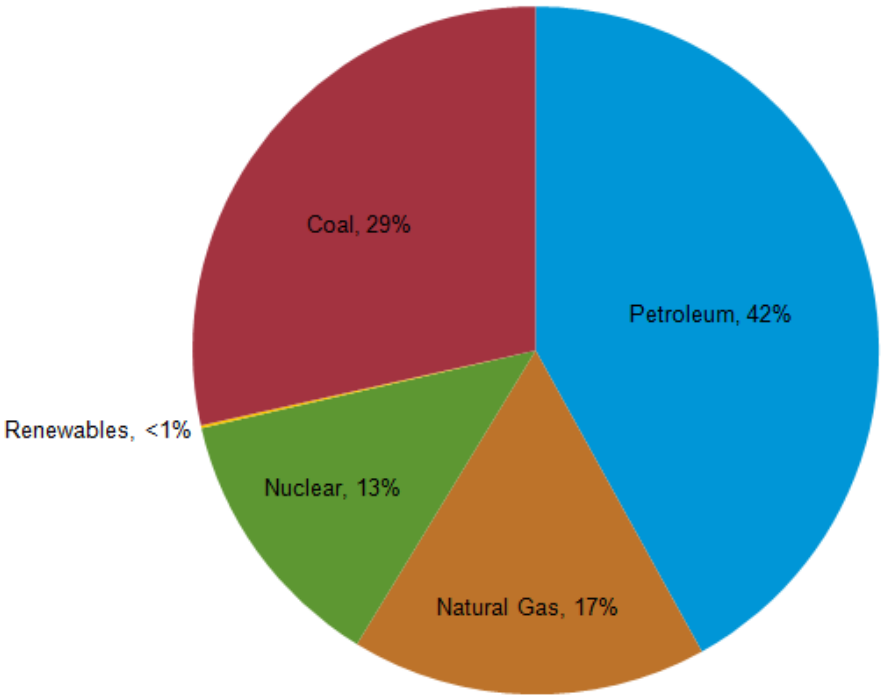
Overview

South Korea is a major energy importer.

EIA estimates that South Korea was the world's tenth largest energy consumer in 2011, and with its lack of domestic reserves, Korea is one of the top energy importers in the world. In 2011, the country was the second largest importer of liquefied natural gas (LNG), the third largest importer of coal, and the fifth largest importer of crude oil. South Korea has no international oil or natural gas pipelines, and relies exclusively on tanker shipments of LNG and crude oil. Despite its lack of domestic energy resources, South Korea is home to some of the largest and most advanced oil refineries in the world. In an effort to improve the nation's energy security, oil and gas companies are aggressively seeking overseas exploration and production opportunities.

Although oil accounted for the largest portion (42 percent) of South Korea's primary energy consumption in 2011, its share has been declining since the mid-1990s, when it reached a peak of 66 percent. This is attributed to the steady increase in natural gas and nuclear energy consumption. The government plans to dramatically increase the nuclear share of total energy consumption in the near future as planned reactors come online.

South Korea total primary energy consumption by fuel type, 2011



Source: U.S. Energy Information Administration

Source: CIA Factbook.

Oil

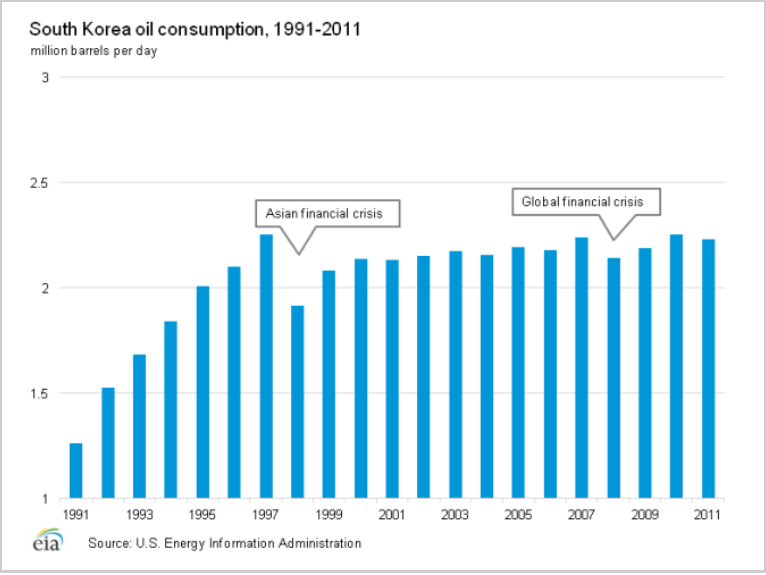
South Korea has a large refining sector, but relies on crude imports for nearly all of its oil

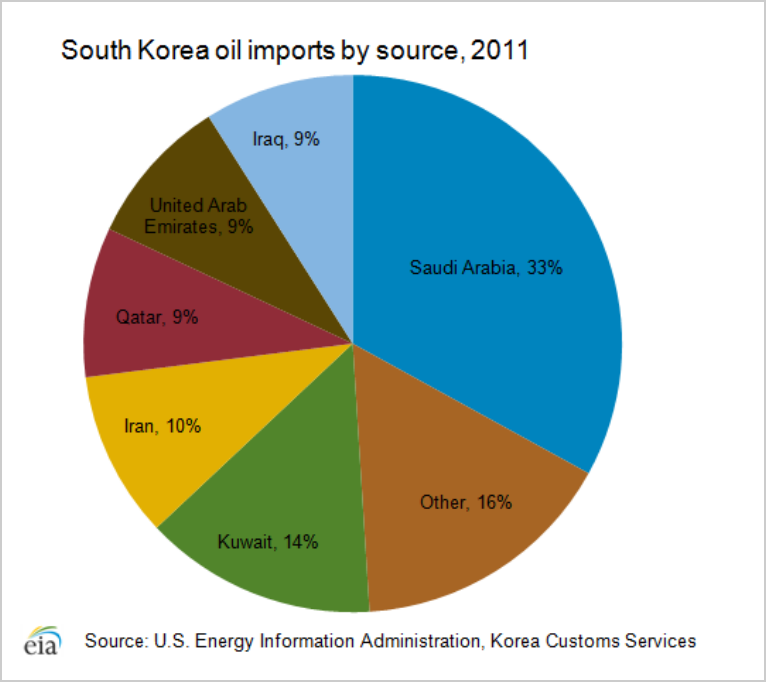
needs.

South Korea consumed over 2.2 million barrels of oil per day (bbl/d) in 2011, making it the tenth largest consumer of oil in the world. According to the Korea National Oil Company (KNOC), Korea has a small amount of domestic oil reserves, but relies significantly on imports to meet its demand. According to the *Oil and Gas Journal*, South Korea maintains three of the ten largest crude oil refineries in the world and exported more than 1.1 million bbl/d of refined products in 2011, an increase of 16 percent from the previous year. Because of increasing demand from Asia, Korea's exports of refined products have been growing at a faster rate than its crude oil consumption, which in the past five years has been rising steadily near 2.2 million bbl/d with the exception of the global downturn in 2008. In order to compensate for its lack of oil reserves and bolster its refined product exports, both its state-owned and private oil companies engage in numerous overseas exploration and production (E&P) projects.

South Korea's oil consumption rates have fluctuated alongside its economy. Oil consumption grew at a rapid pace as did its economy in the 1990s, fell following the Asian Financial Crisis, and rose steadily in the last decade but dipping from the Global Financial Crisis in 2008.

In 2011, South Korea imported over 2.2 million bbl/d of crude oil, making it the sixth largest importer in the world. South Korea is highly dependent on the Middle East for its oil supply, and the region accounted for more than 85 percent of Korea's 2011 crude oil imports. Saudi Arabia was the leading supplier and the source of just under a third, followed by Kuwait at just under 15 percent of total crude oil imports. South Korea, which imported 10 percent of its crude oil in 2011 from Iran, halted shipments for two months in 2012 to comply with the U.S. imposed ban on Iranian imports. After showing good faith effort, South Korea was granted a waiver and began resuming imports from Iran.





Sector organization

The Korea National Oil Corporation (KNOC) is a state-owned oil company and the largest entity in the country's upstream sector with 3.2 million barrels of ultra-light crude domestic reserves. In addition, KNOC, through both acquisitions of overseas companies and investment with major international and national oil companies, maintains a daily foreign production of 219,000 bbl/d and 1.28 billion barrels of oil and gas reserves in 2011.

Korea's downstream sector is home to several large international oil companies including SK Energy, the nation's largest International Oil Company (IOC). SK Energy holds roughly 34 percent of the petroleum product market (excluding LPGs), followed by GS Caltex, S-Oil and Hyundai Oilbank. These corporations have historically focused on refining, but some have put increasing emphasis on crude extraction projects in other countries. SK Energy also owns the largest stake in the Daehan Oil Pipeline Corporation (DOPCO), which exclusively owns and manages Korea's oil pipelines, although most of the country's oil is distributed in tankers or tank trucks.

The Korea-Oil Producing Nations Exchange (KOPEX) was started in 2006 by the Korea Petroleum Association (KPA) to maintain good relations with supplier nations and to offer technology training to producing nations in the downstream sector. In a desire to be less dependent on foreign imports, the Ministry of Knowledge Economy has established oil and gas self-sufficiency targets of 20 percent of all imports in 2012 for South Korean companies. In order to achieve this, the government provides financial support to win bids through the Special Accounts for Energy and Resources (SAER), administered by KNOC, for support on E&P projects.

Exploration and production

After beginning exploration in the 1970s, South Korea discovered one commercially producing field among its Ulleung, Yellow, and Cheju Basins thus far. Discovered in 1998, Donghae-1, Block 6-1 in the Ulleung Basin, has total proven reserves of 250 billion cubic feet (Bcf) of natural gas (see Natural Gas section for further discussion) and oil. While

natural gas production from Donghae-1 began in November 2004, oil production did not begin until 2010 after further exploration and discovery. In 2011, KNOC produced 1,000 bbl/d of ultra-light crude (condensates), representing a negligible portion of its 2.2 million bbl/d total petroleum consumption, nearly all of which is imported. South Korea, which has been exploring at depths of less than 500 feet, plans to explore its domestic basins at depths greater than 1,000 feet.

Although new discoveries might improve domestic oil prospects, overseas E&P plays a more essential role in Korea's oil industry. The Korean government has helped to encourage private E&P overseas through tax benefits and the extension of credit lines to IOCs by the Korea Export-Import bank, as well as by providing diplomatic aid in overseas negotiations. As of December, 2011, KNOC was invested in 215 projects in 24 countries, 57 of which are production projects (see map below for greater detail).

By purchasing stakes in North American oil sands and shale formations, KNOC has diversified its market into unconventional oil and gas. Through the company's oil acquisition of Harvest Energy in Canada, KNOC obtained the lease for BlackGold oil sands, a site with an estimated 259 million barrels of recoverable bitumen reserves. KNOC also acquired two other overseas oil companies in 2009 — SAVIA-Peru and Kazakh Sumbe — and obtained a majority share in UK-based oil company Dana Petroleum in September of 2010.

In the U.S., KNOC has working interest in producing projects in ANKOR and Northstar in the Gulf of Mexico, Old Home field in Alabama, and Parallel project in Texas and New Mexico. In 2011, KNOC acquired a 23.7 percent interest in Eagle Ford shale gas formation, producing 25 million barrels of oil equivalent per day of oil, gas, and natural gas liquids (NGLs).

KNOC's global exploration projects

Source: Korea National Oil Corporation

KNOC's domestic exploration blocks

Source: Korea National Oil Corporation

Downstream and refining

According to *Oil and Gas Journal*, South Korea had 2.76 million bbl/d of crude oil refining capacity at six facilities as of January 1, 2012. South Korea has the sixth largest refining capacity in the world. The country's three largest refineries are owned by SK Innovation, GS Caltex, and S-Oil, the latter of which is partially owned by Saudi Aramco.

South Korea's Oil Refineries, as of January 1, 2012

Owner	Location	Capacity (barrels per day)
SK Innovation	Ulsan	840,000
GS Caltex Corp.	Yeosu	760,000
S-Oil Corp.	Onsan	565,000
Hyundai Oil Refinery Co.	Daesan	310,000
SK Innovation	Inchon	275,000
Hyundai Lube Oil	Busan	9,500

Source: Oil & Gas Journal Refinery Survey

Korean refineries are increasingly producing more light clean products as a result of refinery upgrades that have taken place in recent years. The increasing sophistication of the Korean refining market is likely to increase capacity utilization, which is already quite high

for some refineries. As a result, South Korea is expected to remain a leading refiner in Asia, with significant exports to China, Singapore, and Indonesia. Korean refiners are using their expertise in capacity expansion and teaming up with other oil companies to construct plants in other regions of the world, especially in the Middle East.

South Korea is also a major producer of petrochemicals with 7.3 million tons per year of ethylene capacity. Most of the country's petrochemical plants are integrated into larger refineries such as Inchon, Ulsan, and Daesan. South Korea is home to the single largest aromatics production site in the world, owned by GS Caltex. Upcoming Korean refinery projects include S-Oil's construction of a new $1.2 billion-Benzene, Toluene, and Xylene (BTX) plant, which broke ground in spring 2010.

Oil dependence and outlook

According to the Korea Energy Economics Institute, oil will account for less than 40 percent of total primary energy consumption by 2012, down from 42 percent in 2011, due to an expected increase in the use of natural gas and nuclear power. Other factors affecting long-term demand include more stringent energy efficiency standards and a population that will begin to decline in 2019. In response to South Korea's new energy demands, oil companies have not only upgraded refining facilities and increased upstream investment, but have also begun investing in alternative energy projects. KNOC also plans to increase its oil inventories to 141 million barrels by 2013, with an additional 101 million barrels to be held by the government as international co-operative stocks.

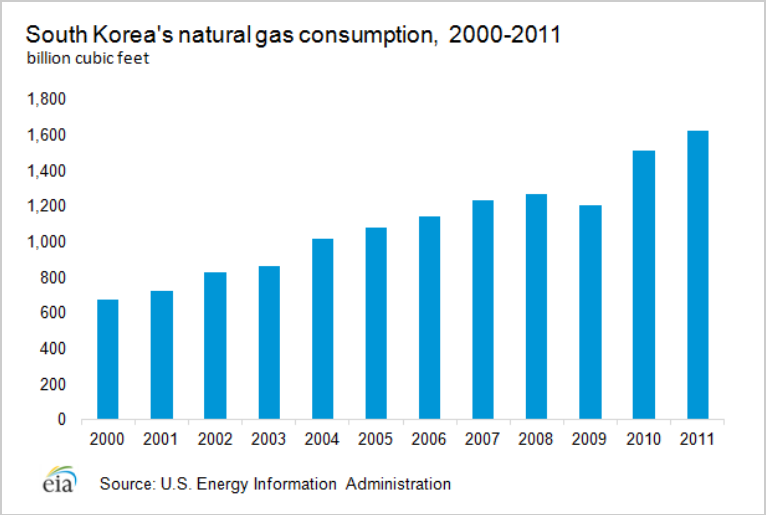
Natural gas

South Korea is the second-largest importer of liquefied natural gas in the world behind Japan.

South Korea relies on imports to satisfy nearly all of its natural gas consumption, which has approximately doubled over the previous decade. While the country has discovered proven reserves of 250 billion cubic feet (Bcf), domestic gas production is negligible and accounts for less than two percent of total consumption. South Korea does not have any international gas pipeline connections, and must therefore import all gas via LNG tankers. As a result, although South Korea is not among the group of top gas-consuming nations, it is the second largest importer of LNG in the world after Japan.

Consumption

South Korea consumed 1.6 trillion cubic feet (Tcf) of natural gas in 2011, which was an increase of more than 125 percent from 2001. The city gas network, serving residential, commercial and industrial consumers, accounted for the majority (54 percent in 2011) of natural gas sales, while power generation companies made up nearly all of the remaining share.



Sector organization

Korea Gas Corporation (KOGAS) dominates South Korea's gas sector and the company is the largest single LNG importer in the world. In spite of recent efforts to liberalize the LNG import market, KOGAS maintains an effective monopoly over the purchasing, import, and wholesale distribution of natural gas. In addition to operating three of Korea's four LNG receiving terminals, KOGAS owns and operates the 1,790-mile national pipeline network, and sells regasified LNG to power generation companies and private gas distribution companies.

The Korean central government is the largest KOGAS shareholder with 26.9 percent direct equity, and an additional indirect 24.5 percent via the Korean Electric Power Company (KEPCO). Korea has 30 private distribution companies, but each has an exclusive sales right within a particular region. These local companies purchase wholesale gas from KOGAS at a government-approved price, and sell gas to end-users. Since June 2011, city gas companies have been allowed to source gas produced from coal or refineries, as gas demand peaks in winters, while wholesale gas prices have been frozen by the government to protect end-users.

In the upstream, KOGAS has historically focused primarily on overseas LNG liquefaction projects, while the Korea National Oil Corporation (KNOC) has handled most exploration and production-related activities. As KOGAS seeks new opportunities for growth however, its focus on overseas upstream activities is increasing.

Exploration and production

South Korea produced about 18 Bcf of natural gas (about 1.3 percent of consumption) in 2011 from the domestic gas field in production, Donghae-1 in the Ulleung Basin. KNOC will continue production operations until 2018, when the project will be converted into an offshore storage facility. State-owned Gas Hydrate Research & Development has conducted studies of deposits of methane hydrates in the Sea of Japan, and the government has previously announced plans to start extracting methane hydrates from the sea by 2015.

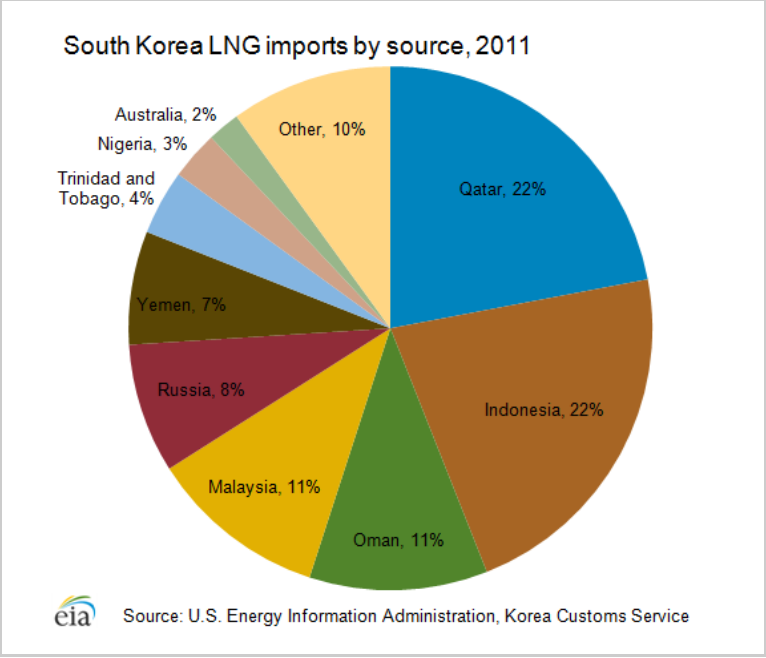
As part of the effort to develop into a global integrated energy company, KOGAS is participating in 26 projects, 13 of which are either solely E&P projects in 16 countries. South Korea holds equity shares in four production-stage projects, namely 50 percent in Canada's

Encana project, 3 percent in Qatar's RasGas project, 8.9 percent in Yemen's YLNG project, and 1.2 percent in Oman's Oman LNG project. It is KOGAS' mid-term goal to secure 25 percent of gas imports from equity production sources by 2017.

Liquefied natural gas

South Korea has four LNG regasification facilities, with a total capacity of 4.5 Tcf per year. KOGAS operates three of these facilities (Pyongtaek, Incheon, and Tong-Yeong), accounting for about 95 percent of current capacity. Pohang Iron and Steel Corporation (POSCO) and Mitsubishi Japan jointly own the only private regasification facility in Korea, located on the Southern Coast in Gwangyang. In 2011, South Korea imported 1.6 Tcf of LNG. KOGAS purchases most of its LNG through long-term supply contracts, and uses spot cargos primarily to correct small market imbalances. Almost two-thirds of 2011 natural gas imports came from Qatar, Indonesia, Malaysia, and Oman.

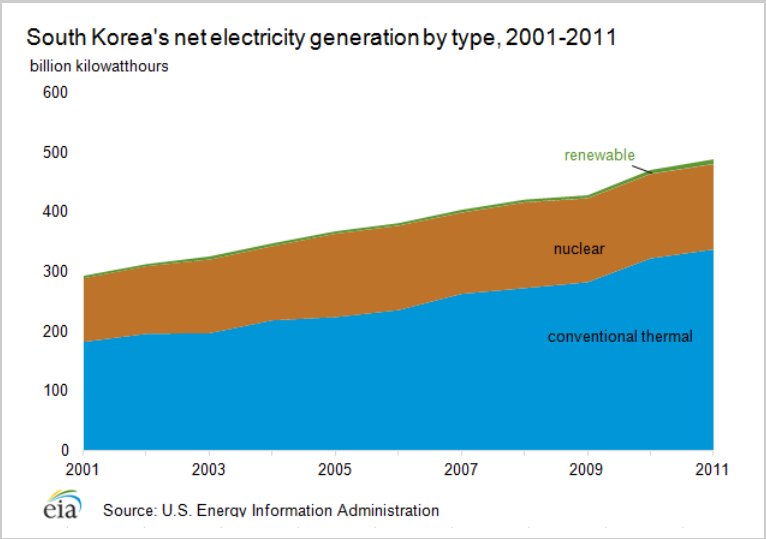
Nearly an additional 1 Tcf of regasification capacity had been added since 2010. In addition to recent expansion of existing facilities, KOGAS is planning a new 487 Bcf per year facility at Boryeong, whose first unit is scheduled for completion by 2013, second by 2019. KOGAS is currently constructing a new LNG receiving facility at Samcheok, on the Northwest coast. The first stage of 278 Bcf per year is slated for 2013 completion, with supplies of 350 Bcf per year to be met primarily through gas imported from Vladivostok, Russia starting in 2015. Although the associated 2008 KOGAS-Gazprom Memorandum of Understanding indicated that the gas could be imported either as LNG or pipeline gas from Vladivostok, Russian and Korean leaders recently acknowledged that the pipeline construction option most likely will not be deemed economically feasible without the cooperation of North Korea.



Electricity

Conventional thermal power accounts for more than two-thirds of South Korea's electricity generation.

South Korea generated about 485 billion kilowatthours of net electricity in 2011. Of this amount, 69 percent came from conventional thermal sources, 30 percent came from nuclear power, and roughly 1 percent came from renewable sources. Although thermal capacity is dominant in Korea at present, nuclear power is set to expand over the next decade, along with significant investment in offshore wind farms.



Sector organization

The state-owned Korea Electric Power Corporation (KEPCO) dominates all aspects of electricity generation, retail, transmission, and distribution. In 2001, KEPCO's generation assets were spun off into six separate subsidiary power generation companies. Although the initial restructuring included plans to subsequently divest KEPCO of these generation companies (excluding the Korea Hydro & Nuclear Power Company), KEPCO continues to wholly own each of the subsidiaries. Furthermore, KEPCO owns majority shares of KEPCO Engineering and Construction, Korea Nuclear Fuel, Korea Plant Service and Engineering, and Korea Electric Power Data Network.

The Korea Electric Power Exchange (KPX), also established in 2001 as part of the electricity sector reform efforts, serves as the system operator and coordinates the wholesale electric power market. KEPCO continues to act as the electricity retailer, and controls transmission and distribution.

KPX regulates the cost-based bidding-pool market, and determines prices sold between generators and the KEPCO grid. An electricity tariff pricing system, designed to protect low-income residents and industrial consumers, historically has not reflected the true costs of generation and distribution, or provided incentives to conserve electricity. MKE must approve all changes in end-use electricity prices.

Generation structure

According to KEPCO, in 2011 about 81 percent of electricity consumers were residential, 17 percent were commercial and public, and 2 percent were industrial.

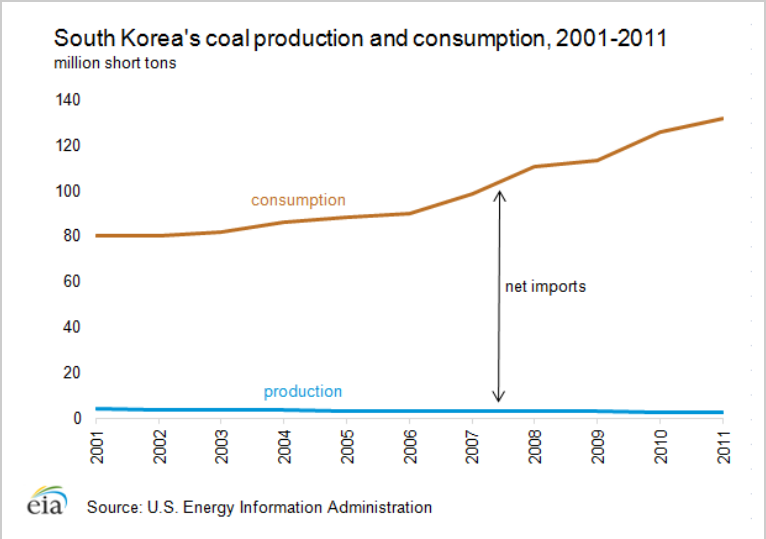
South Korea has the sixth-highest nuclear generation capacity in the world. Its first nuclear plant was completed in 1978, and over the following three decades, South Korea directed significant resources towards developing its nuclear power industry. Korea Hydro & Nuclear

Power Co. currently operates South Korea's four nuclear power stations, with 20 individual reactors. Fourteen additional reactors are scheduled to be completed by 2024, with the goal of generating nearly half of the power supply from nuclear sources. Emerging as an international leader in nuclear technology, Korea is pursuing opportunities to export its technologies. In December of 2009, KEPCO won a $20 billion contract to build four 1,400 megawatt nuclear reactors in the United Arab Emirates, the first of which is expected to become operational by 2017.

A renewable portfolio standard for South Korea became effective in 2012 with a beginning renewable electricity quota of 2 percent of total generation. Renewable sources remain a small share of South Korea's electricity generation, with hydropower being limited to small dams on the Han River, and a 1 billion kilowatt (kW) pumped-storage facility at Yangyang, 120 miles from the capital of Seoul. The Korean government plans to invest $8.2 billion into offshore wind farms in order to reach a wind capacity of 2.5 billion kW by 2019, from only 0.3 billion kW in 2008.

Coal

South Korea held only 139 million short tons (MMst) of recoverable coal reserves in 2008. Consumption reached 131 MMst of coal in 2011, while production was less than 3 MMst. As a result, South Korea is the third largest importer of coal in the world, following Japan and China. Australia and Indonesia account for the majority of South Korea's coal imports. Coal consumption in South Korea increased by just under 50 percent between 2005 and 2011, driven primarily by growing demand from the electric power sector. The electric power sector accounts for more than half of coal consumption, while the industrial sector accounts for most of the remainder.



Notes

- Data presented in the text are the most recent available as of January 17, 2013.
- Data are EIA estimates unless otherwise noted.

Sources

- Asia Pacific Petroleum Monthly
- Bloomberg
- The Economist Intelligence Unit
- FACTS Global Energy
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- Korea Customs Services
- Korea Electric Power Corporation (KEPCO)
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